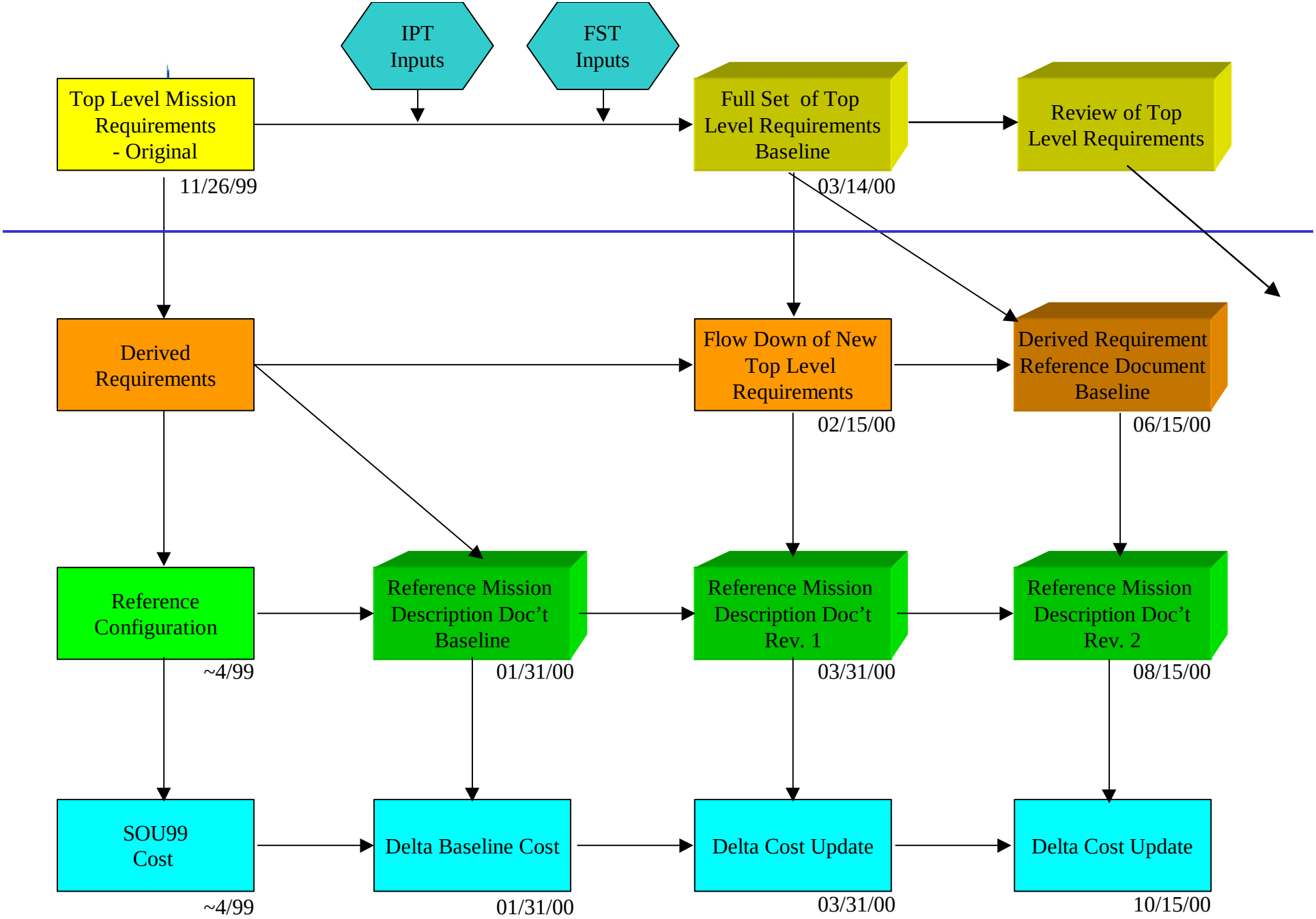
Top Level Functional and Performance Requirements

- Topics:
  - Requirements Process & Timeline
  - Summary of Old Requirements and revisions (11+3)
  - New Requirements - values/issues/discussion (10)

- Overall Questions:
  - Is the requirements list complete?
  - Are the values correct, given current knowledge?
  - What requirements need to have goals defined (as opposed to the requirement)?


IPT Inputs
FST Inputs
Top Level Mission Requirements - Original
11/26/99
Full Set of Top Level Requirements Baseline
03/14/00
Review of Top Level Requirements
Derived Requirements
Flow Down of New Top Level Requirements
02/15/00
Derived Requirement Reference Document Baseline
06/15/00
Reference Configuration
~4/99
Reference Mission Description Doc't Baseline
01/31/00
Reference Mission Description Doc't Rev. 1
03/31/00
Reference Mission Description Doc't Rev. 2
08/15/00
SOU99 Cost
~4/99
Delta Baseline Cost
01/31/00
Delta Cost Update
03/31/00
Delta Cost Update
10/15/00

"Old" Requirements I

- Unchanged:
  - Spatial Resolution
  - Field of View
  - Bandpass
  - Celestial Coordinate Accuracy
  - Sky Coverage
  - Observation Durations
  - Viewing Efficiency
  - Mission Life
  - Redundancy
  - Reliability (but all values TBD).
  - Orbit

"Old" Requirements II

- Modified
  - Effective Area:
    - now defined at 4 energies, adding the requirement of 1,000cm^2 at 0.3A (TBR)
  - Spectral Resolution:
    - A minimum resolving power of 3000 is specified from 6.0 to 10.0 keV.
  - Reliability
    - now 25% vs. 33%, excludes loss due to LV

New Requirements Summary

- Photometric Accuracy and Stability
  - Absolute
  - Relative
- Spectral Accuracy and Stability
- Bright Source Capability
  - Point Source
  - Extended Source
- Extended Source Capability
- Timing Resolution and Precision
- Targets per Day
- Real Time Observing
- Data Latency
- Data Downlink
- Data Storage

Photometric Accuracy and Stability

- Requirements:
  - Absolute: 10% (context: Chandra goal is ~1%)
  - Relative: 5%
  - At any time during the mission.
- Issues:
  - Are these the right values?
  - Should relative be across entire bandpass (currently), or within an instrument bandpass?
  - Do we need better relative accuracy for particular line ratios? If so, can we do this “locally” rather than globally?
  - How will this be calibrated?

Spectral Accuracy and Stability

- Requirement:
  - <25% of the wavelength (energy) resolution at any time during the mission
- Issues:
  - Is this adequate for e.g., the velocity studies that are anticipated. We can centroid a strong line to >10x better than the resolution, but observations at different epochs may be limited by the spectral accuracy.
  - Can this be achieved for the current instrument set?
  - Is it necessary for all observations, or just “precision” subsets?
  - Will impact ground and in-orbit calibrations.
  - May impact viewing efficiencies

Bright Source Capability

- Point Source Requirement:
  - 10000 cps (TBR) from 0.2 to 10 keV in a telescope beamwidth for at least one instrument without degrading spectral resolution
- Extended Source:
  - 10000 cps (TBR) from 0.2 to 10 keV over the field of view
- Issues:
  - count rates chosen to allow viewing of all but the bright ~few sources. May be too stringent, and drops quickly if we don't observe ~20 brightest sources.
  - May need to specify total allowed durations

Extended Source Capability

- Requirement:
  - Capable of obtaining spectra with the previously stated spectral and spatial resolutions from ~1 to 40 keV for sources which are larger in extent than the telescope F.O.V.

- Issues:
  - Unless a lower limit bandpass is imposed, this is problematic for the CCD/Grating combination.

Timing Resolution and Precision

- Requirement:
  - Individual photon events shall be time tagged with a resolution of +/- 40 microseconds, and a precision of 100 (TBR) microseconds relative to UT time

- Issues:
  - ?

Targets per Day

- Requirement:
  - 5 per day
  - Selected to ensure that a significant number of sources could be observed during the early operations phase
- Issues:
  - ?
- Note:
  - With an addition assumption regarding the duration of the observations, can yield a constraint on the s/c slew rates & settling times.

Real Time Observing

- Requirement:
  - There is no requirement for real time observing during normal science operations
- Issue:
  - Some sentiment to make this “never”. But initial operations and checkouts probably will require some real time contacts and possibly observing, but not necessarily “science” observing.

Data Latency

- Definition:
  - Time from completion of an observation to the time level 1 science data is “in hand” by the PI
- Requirement:
  - 72 hours
- Issues:
  - Chosen almost arbitrarily as a starting position.

Onboard Data Storage

- Requirement:
  - TBD. Perhaps “Adequate to store up to 2 days of continuous observing”
- Current Planned Capability
  - 9.1 Gb
- Issue:
  - May not really be a top level requirement.
  - If we specify as above, need to consider how bright the sources are, etc.

Data Downlink

- Requirement:
  - TBD. Maybe “Adequate to downlink 24 hours of observing per 8 hour ground contact”
- Current Planned Capability:
  - 1.7Mbs
- Issues:
  - May not be a top level requirement.
  - May need to specify whether its “typical” observing

Detector Backgrounds

- Requirement:
  - No current values
- Issues:
  - Highly instrument dependent
  - Open for discussion